We Don't Need Any Stinking AFSRB!

Bart Henwood

Flight Test Safety Workshop

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Introduction

- Purpose
- Structure
- Airworthiness
- Risk Assessment
- Accountability

Purpose

- Context: Flight Test
- Supports four needs
  - Managements approval to proceed
  - Establish a record of accountability
  - Inject expert insight into the risk management process
  - Mitigate the human factors vulnerabilities associated with small group teaming and project ownership

Purpose

- Essential is a clear statement of the boards domain of assessment and the roles and rules governing its conduct
  - Complicated by a multi-organization test team
- Typically constrained to:
  - Airworthiness of the test vehicle/item
  - Safety/Mission Assurance of the vehicle and test operations based on
    - Environment
    - Team composition
    - ?

Structure

- Prerequisites/Timing
  - Technical reviews completed including instrumentation design
  - Close enough to flight test to
    - Define flight test maneuvers and test approach
    - Stabilize the design by ground test results
  - Sufficient time to respond to board actions
- Membership
  - Organizational
    - Multi-organizational boards complicate roles
  - Functional
    - Facilities, modification, instrumentation,, management
  - Technical
    - Test disciplines, technology experts, engineering
- Involvement/Decision Authority

Structure

- Involvement/Decision Authority
  - Decision authority apportioned to level of perceived risk
  - High complexity tests/systems
    - Require more time to assess
    - May require a team of specialists
  - Independence
    - Distanced from day-to-day operations/teaming
    - Non-stakeholder

Airworthiness

- Standard should be defined
  - Depends on vehicle test outcome
  - Research:
    - Experimental class for commercial
    - Gov't agency could use internal standard
  - Military development
    - Commercial or internal
  - Commercial
    - FAR Part Standards

Airworthiness

- Review addresses standards compliance
  - Primary focus is safety implications
    - Environmental suitability
    - Safe energy transfer/containment
    - Flight Control
      - Software development standards, V&V
      - static and dynamic stability margins
      - Adequate performance & structural margins
    - EMI/EMC, etc…
  - Ground tests are the typical evidence

Risk Assessment

- Decision Authority
  - Usually prescribes the methodology
  - Complicated by multi-organizational roles – build in overlap
- Risk Characterization
  - Hazards identified via SSWG
    - Cause - Mechanism – Consequence
    - Mitigations should target Causes
    - Corrective Actions address "realized" risk
    - Consequence + probability of occurrence = risk
  - Matrixed cross plot divided into regions of risk gradation
    - High / medium / low

Risk Assessment

- Key risk areas with safety & mission assurance implications
  - Design/Technical
    - System (integrated)
    - Subsystem
  - Operational
    - Test maneuvers
    - Environmental conditions

Risk Assessment

- Board Guidelines
  - Understand source of consequence and probability
    - Data behind probability quantification/experiential assessment for qualification
    - Non-mitigated risk assessment (where did we start)
    - Worst case consequence vs. all significant outcomes
    - Total program vs. singular event exposure assessed
    - Assumptions that underly the analysis
  - Review non-credible hazards
  - Proper consideration of multiple event failures

Risk Assessment

- Board Guidelines
  - Type of mitigations support final risk claim
    - Over utilization of human dependent mitigations
    - Recognition time and speed of response appropriate
    - Adequate lines of defense
    - Training necessary to be effective
    - Communications complexity (layers, SA, language, seniority, personality)
    - Integrated team response - appropriate CRM
    - Pre-determined vs. ad hoc judgment application

Risk Assessment

- Board Guidelines
  - Transition from many individual risks to the integrated risk picture
    - Widely ignored in an qualitative assessment
    - Must assess dependency across hazards unless willing to live with independent assumption (form of worst case analysis)
    - Relies heavily on ability to stop, move to a safe condition and land
  - Test Conditions really required?
    - Traceable to a requirement
    - Operationally suitable

Risk Assessment

- Board Guidelines
  - Do hazards address group HF failures
    - Decline of independence over time
    - Turnover of personnel
    - Increase in complacency with success
  - "Cost of doing business" mentality

Accountability

- Accountability within the process
  - Ensure sufficient time for reviews – sufficient time for prep material review
    - Reasonable durations – all day?
  - Target complex areas with specialty teams and increased interface
  - Capture and address all concerns
  - Do not allow time to force a decision

Accountability

- Accountability to the process
  - Provide written expectations
    - Content
    - Timing – NET X days before first flight
    - Readiness
  - Assess effectiveness
    - Process to decision effectiveness/efficiency
    - Decision effectiveness (long term)
      - Poor risk characterization
      - Unidentified risk realization (process escapes)
  - Modify and codify the process

Accountability

- Decision Accountability
  - Clear written authorization
    - Periodic reports
    - End point delineated
  - Clear closure actions with record of
  - Clear return criteria – could be to a different decisional authority

Job Done?

- No!!
- Visit – a matter of good communication not trust!
- Assess
  - Culture
  - Pace of operations/Situational Awareness
  - Understanding